

A Literature Review for Landscape Ecological Strategies to Forest Restoration of Burned Areas in Korea

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Introduction

- Since 1990s, Korea has been experiencing many catastrophic forest fires resulted in thousand hectares of burned forests, lives, houses, and other economic losses. KFS(Korea Forest Service) characterized these recent fires with magnified fire size, complexity of damages including ecological, environmental and socio-economic areas, and high diversity of relevant interest groups (KFS, 2005).
- Post-fire restoration plans for damaged areas were very limited in strategies, goals, methods, and action plans, and they were not able to encompass the main characteristics of recent catastrophic fires into restoration plans.
- There have been calls for comprehensive restoration methods for burned forests that can integrate the complexity and diversity of fire damages, as well as magnified fire size of burned forests into decision making processes including assessment, evaluation, and making alternative plans.
- In the light of these, this study aims to explore strategies of landscape ecological restoration strategies for burned forests. Landscape ecological models have been widely used to handle complex environmental problems in North America and Europe, as well as other parts of the world, and the models have been known to be able to encompass the complex aspects of environmental issues (Baker, 1992; Collins et al., 2007).

Main Traits of Landscape Ecology

- Forest structure including forest composition and configuration has impacts on fire behavior such as fire ignition, fire spread, fire severity, and post-fire regenerations (Brown and Smith, 2000; Cardille and Ventura, 2001; Collins et al., 2007; Gustafson et al., 2004).
- Making and managing appropriate forest structure is an important for forests that are persist to recurrence of fires.
- Most ecological phenomena is scale dependent including forest fires (Turner et al, 2001). Forest fires varies in size, affects forest ecosystems accordingly, differently at different level of scale in the forest ecosystem hierarchy.
- Thus restoration plans should be different corresponding to fire scales. Landscape Ecology takes human dimensions into account in understanding environmental phenomena, as well as ecosystems. And the present landscapes are resulted from interactions between human systems and ecosystems (Naveh, 2000).
- Restorations are viewed as the process to build better THE integrating human systems and ecosystems together. For this, multi-criteria in decision making processes and inter-disciplinary approaches are necessary, which is called "holistic approach" or "comprehensive approach."

Landscape Ecology Restoration Strategies

1. Restoration phases

- Landscape ecology deals with landscape structure and functions (Turner et al, 2001). And forest structure appears to be important for fire behavior, regeneration and functions of forests.
- Considering that the final goals of the restorations in damaged forests is building THE, we can classify the restoration processes into three phases: short-term restoration (structural restoration), intermediate-restoration (functional restoration), and long-term goals (THE).
- And these should be feedback systems that can allow adjust the courses of previous phases (see Table 1).

Table 1. Comparison between short-, intermediate, and long-term restoration phases

phases	time	Cost	scale	goals	main actions
SR	0 – 2 yrs	+++	+	structure	Assessment, evaluation, planning, field works
IR	2 – 10 yrs	++	++	function	Monitoring, supplementary field works
LR	10–30 yrs	+	+++	THE	Communications, education, land use changes

SR: Short-term restoration, IR: Intermediate-restoration, LR: Long-term restoration

2. Restoration hierarchy

- Hierarchy theory strongly suggests that we should consider at least three different scales to understand the true nature of ecological phenomena (Turner et al, 2001). The same principle can be applicable to forest restorations.
- There can be three different levels of scales in forest restoration to consider. They are ecoregion scale, damaged scale, and sub-damaged scale.
- The ecoregion scale allows us to understand the ecological meanings (core areas, buffers and edges, critical habitats, and etc) and contexts (connectivities, gaps, and etc) of damaged forests, provides restoration goals of damaged areas, and should be assessed prior to the fire events.
- The damaged forest scale is the main scale of interests in restoration and includes actual burned areas, and should be right after the fire event.
- The sub-damaged scale is subsets of damaged areas, including variations and changes in environmental and ecological conditions (see Figure 1). Thus sub-damaged restoration is dependent to damaged forest scale, and the damaged forest scale is dependent to ecoregion scale. Higher scale restoration plans can provide guidelines for lower restoration scales.

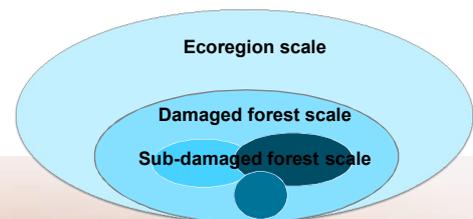


Figure 1. Conceptual hierarchy of restoration plans

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